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This Software Users Manual (SUM) is written for the Generic Avionics Data Bus Tool Kit (GADBTK) version 1.1. The GADBTK is an Ada Technology Insertion Program (ATIP) sponsored effort to produce an Ada binding with the MIL-STD-1553B time multiplex serieal data bus.

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SOFTWARE USERS MANUAL

For The

GENERIC AVIONICS DATA BUS TOOL KIT

Of The

ADA TECHNOLOGY INSERTION PROGRAM

Prepared For

ADA JOINT PROGRAM OFFICE

Prepared By

COMPUTER TECHNOLOGY & SIMULATION DEPARTMENT
SYSTEMS ENGINEERING TEST DIRECTORATE
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NAVAL AIR WARFARE CENTER / AIRCRAFT DIVISION

17 July 1992

1.0 SCOPE

1.1 Identification

This Software Users Manual (SUM) is written for the Generic Avionics Data Bus Tool Kit (GADBTK) version 1.1. The GADBTK is an Ada Technology Insertion Program (ATIP) sponsored effort to produce an Ada binding with the MIL-STD-1553B time multiplex serial data bus.

1.2 System Overview

The GADBTK is to produce an Ada binding to the 1553B standard by defining the hardware elements and data structures used in a 1553 data bus system in terms of the Ada language. These definitions will then be used to provide various building block components from which 1553 data bus applications may be constructed. Finally a bus monitor application will be constructed from the components as a proof of concept. Initial target system for this project will be a Digital Equipment Corporation VAXStation 3200 series computer with a Computer Technology & Simulation Dept developed Microprogrammable Multiplex Bus Interface (CTSD-MMBI).

1.3 Document Overview

This manual will detail the application interface to the 1553 - Ada binding, and the user interface to the bus monitor application. The document will be divided into two parts the first will show how an application programmer would use the interface. The second will detail the operation of the bus monitor application including how to start it, the commands available while using it, and how to shut it down. In the appendix a list of possible error messages, their most likely cause, and the suggested remedy are provided.

2.0 REFERENCED DOCUMENTS

2.1 Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

STANDARDS:

Military

MIL-STD-1553B, 8 September 1986 Digital Time Division Command/Response Multiplex Data Bus

MIL-STD-1815A, 22 January 1983 Ada Programming Language

DOD-STD-2167A, 29 February 1988 Defense System Software Development

OTHER:

SDD for the Generic Avionics Data Bus Tool Kit, 4 October 1991

SRS for the Generic Avionics Data Bus Tool Kit, 7 August 1991

2.2 Non-Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

STANDARDS:

AA-EF88A-TE, February 1985	VAX Ada Programmer's Run-Time Reference Manual
F-6/89-10M, 1988	MIL-STD-1553 Designer's Guide, DDC ILC Data Device Corporation
ISBN 0-442-23805-3, 1989	Ada Quality and Style, The Software Productivity Consortium
MFS Users Manual, Volume 3	Software Style Guide and Configuration Management.

3.0 EXECUTION PROCEDURES

3.1 Bus Interface

a. Initialization.

There are two steps to initializing the 1553 interface package. The first is to call the Select_Unit procedure to select a UNIBUS adaptor MMBI interface and data bus. Then call one of the three start procedures.

An interface can only be used in one of the three modes (Remote Terminal, Bus Controller, Monitor) at a time. An interface being used as a remote terminal or a monitor can support several remote terminal addresses at a time. An interface can also only be connected to a single bus at a time. If more than one mode are needed from within a single application at the same time this can be achieved by using the Select_Unit procedure to toggle the context between different interfaces. A single application can also use the Select_Unit entry to maintain interfaces on multiple buses simultaneously.

The Start procedures do not modify the firmware load in the interface at the time they are invoked. Therefore it is the application's responsibility to make any firmware modifications necessary before calling Start_. When using the Computer Technology & Simulation Department's MMBI interface the package MICROCODE_1553 included in this tool kit can be used to interface with the firmware

To use the Transmit, Monitor, Receive procedures they must be instantiated with a buffer type of the users preference, and either a command word or a status word. The buffer is a contiguous data structure the size of the number of words to transmit or receive. The buffer type can be whatever is best suited to the application as long as the memory is contiguous and the size is correct. The following table illustrates the type of bus word to use.

Interface Mode	MESSAGE_TYPE	Procedure	Bus Word Type
Bus Controler	COMMAND	Transmit	Command_Word
	RESPONCE	Receive	Status
Remote Terminal	COMMAND	Receive	Command_Word
	RESPONCE	Transmit	Status

b. User Inputs.

Interface_Number : AN_INTERFACE
Bus_Number : A_MFS_BUS
Unibus_Number : A_UNIBUS

Remote_Terminal : A_REMOTE_TERMINAL_ADDRESS
Data : A_TRANSMIT_MESSAGE_BUFFER
Bus_Word : A_BUS_OVERHEAD_WORD
Form : MESSAGE_TYPE
Subaddress : A_SUBADDRESS
type A_TRANSMIT_MESSAGE_BUFFER
type A_BUS_OVERHEAD_WORD
type A_RECEIVE_MESSAGE_BUFFER
type A_MONITOR_MESSAGE_BUFFER

c. System Inputs.

Bus Data : A_DATA_WORD;

d. Termination.

To terminate the bus interface call the Stop_ procedure(s) that corresponds to the Start_ procedure(s) that was/were called during initialization.

e. Restart.

Repeat the initialization procedure.

f. Outputs.

BUS_DATA_FORMAT_ERROR : *exception*;
HARDWARE_FAILURE : exception;
KERNAL_SYSTEM_ERROR : exception;
RANGE_ERROR : exception;
Status : out A_BUS_STATUS);
Bus_Word : out A_BUS_OVERHEAD_WORD;
Time : out A_TIME_TAG;
Command_Word : out A_DATA_COMMAND_WORD;
Data : out A_MONITOR_MESSAGE_BUFFER;
Status_Word : out A_STATUS_WORD;
Time : out A_TIME_TAG;

3.2 Monitor Application

a. Initialization.

The only initialization necessary to run the software is making sure the default path

contains the data file PORTS_1553. This file is necessary for the application to start processing but no hard coded path exists in the application so that different files could be used to change the configuration from machine to machine.

b. User Inputs.

HEX	Set Data Format Hex
DECIMAL	Set Data Format Decimal
BINARY	Set Data Format Binary
OCTAL	Set Data Format Octal
PREFERED_DATA	Set Mode Prefered Data
RAW_DATA	Set Mode Raw Data
RESET_DISP	Refresh Display
CANCEL_SELECTION	Stop Montoring Selected RT
RT	Choose an RT
QUIT	Exit Program

c. System Inputs.

n.a.

d. Termination.

Type Quit at the input prompt to terminate.

e. Restart.

See initialization.

f. Outputs.

Bus_Data in either priority mode display or raw data display.

Status and error messages relating to the application.

Prompts for more data to be supplied by user.

3.2.1 Error Messages

In general error messages preceded by a % follow the same general conventions as VMS. That means the first part of the error ID is the subsystem that generated the error, the second part is the severity, the third part is the abbreviated message text, the final field is an english language description of the error.

The format of this section of this document is to list the error, then on the indented lines

that follow the possible cause and if applicable the remedy are listed.

%GETMSG-E-NOMESSAGE, unable to retrieve message text

A system error has occurred and the system supplied message text can't be loaded.

%DPMAN-I-PARTINIT, Dual_Port_Ram in use - partial initialization performed

The dual port ram allocation program is not the first to map dual port.

This is not an error and should not be a cause for concern. It simply means someone else is also using the interfaces on this machine.

%MON1553-W-UNIMPL, that command is not currently supported

The command parser accepts all valid commands, however not all the valid commands are currently implemented in the executive.

%GETSEL-E-CONSTERR, a selection parameter is out of range

One of the values in an RT selector is out of the acceptable limits.

Reselect the RT with new parameters.

%SELECT-E-NOTINIT, an error occurred initializing RT# check process privileges

The most likely cause of this error is the lack of sufficient process privileges to execute the application. When the application starts an RT it creates and maps a global section, to

do this you need the VMS privileges PRMGBL, PHYMAP, CMEXC. If this error occurs exit the application, set the appropriate privileges, and restart the application.

%SELECT-E-INSUFMEM, insufficient memory for allocation of RT

There is not enough dual port ram remaining to allocate another RT. This may be due to a lack of actual memory or the allocation table may simply be full. In either case you will have to reconsider the amount of RTs being run on the Interface.

%SELECT-E-PRMERR, parameter error, check bus and interface numbers

The bus or interface number passed to the select_unit procedure are out of range.

%INPAR-F-RNDZFAIL, Task input parser appears to have terminated abnormally

_INPAR-I-ERRORAT, This error occurred at rendezvous KILL_PARSER in task PARSER

An error occurred shutting down the application's input task. Quit the application with a CTRL-Y if necessary and restart.

%PARSER-F-UNHDLEXPT, parser task is terminating due to an unhanded exception

Some unanticipated user input has caused the parser task to die prematurely. Use CTRL-Y to exit.

%INPAR-F-UNHDLEXPT, error initializing IP_USER_COMMAND_INTERFACE package

Some problem kept the input parser task from starting.

%OUTFM-F-RNDZFAIL, tasking error occurred shutting down display tasks

During an application exit the display task exited abnormally.

%CLOCK-F-RNDZFAIL, task id TIMMER exiting due to error in rendezvous

Probably caused by the display task dying due to an error.

OUTFM-F-CONSTERR, task id FORMATTER died due to constraint error

Some data that was to be displayed was out of bounds.

OUTFM-F-TASKNERR, task id FORMATTER died due to tasking error

Some type of erroneous program state developed. Restart the application.

Bad data entered, please try again

The type of data entered by the user was inconsistent with the type expected.

Sub Address out of range (0..31)

enter a value from 0 to 31.

Remote Terminal out of range (0..31)

enter a value from 0 to 31.

Queue limit reached, Please wait

The command input que is full, processing input will continue as soon as the que has space available.

ERROR IN COMMAND, Pleae try again

Command syntax was incorrect.

CHARACTER ERROR, Please reenter command

An invalid Ada character was entered from the command line.

NUMBER ERROR ON DATA FOR SA,BN, OR RT

One of the selection parameters contained a non numeric character.

Prompt number not reconized

An invalid prompt string was requested. This is an internal error and should be ignored by non developers.

Invalid Entry

The data entered does not match the expected input.

Input string to long

The length of the text typed exceeds the length of the input buffer.

4.0 NOTES

4.1 Definition Of Terms and Abbreviations

AN/AYK	-	(Navy standard embedded mission processor)
ATIP	-	Ada Technology Insertion Program
BC	-	Bus Controller
CSCI	-	Computer Software Configuration Item.
CSU	-	Computer Software Unit.
CTSD	-	Computer Technology and Simulation Department.
DCL	-	Digital Command Language
DEC	-	Digital Equipment Corporation
GADBTK	-	Generic Avionics Data Bus Tool Kit
RT	-	Remote Terminal
UART	-	Universal Asyncronous Receiver / Transmitter
VAX	-	Virtual Address Extension (DEC mini computer architecture)
VMS	-	Virtual Memory System (VAX operating system)